

NASA SP-7011 (425)  
October 28, 1996

# **AEROSPACE MEDICINE AND BIOLOGY**

A CONTINUING BIBLIOGRAPHY WITH INDEXES



National Aeronautics and  
Space Administration  
**Langley Research Center**  
**Scientific and Technical  
Information Program Office**

# The NASA STI Program Office ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program Office plays a key part in helping NASA maintain this important role. The NASA STI Program Office is operated by Langley Research Center, the lead center for scientific and technical information.

The NASA STI Program Office provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program Office is also NASA's institutional mechanism for disseminating the results of its research and development activities.

Specialized services that help round out the STI Program Office's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results ... even providing videos.

For more information about the NASA STI Program Office, you can:

**Phone** the NASA Access Help Desk at (301) 621-0390

**Fax** your question to the NASA Access Help Desk at (301) 621-0134

**E-mail** your question via the **Internet** to [help@sti.nasa.gov](mailto:help@sti.nasa.gov)

**Write to:** NASA Access Help Desk  
NASA Center for AeroSpace Information  
800 Elkridge Landing Road  
Linthicum Heights, MD 21090-2934

# Introduction

This issue of *Aerospace Medicine and Biology, A Continuing Bibliography with Indexes* (NASA SP-7011) lists 35 reports, articles, and other documents recently announced in the NASA STI Database.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.

Two indexes—subject and author are included.

The NASA CASI price code table, addresses of organizations, and document availability information are located at the back of this issue.

# *SCAN Goes Electronic!*

If you have electronic mail or if you can access the Internet, you can view biweekly issues of *SCAN* from your desktop absolutely free!

*Electronic SCAN* takes advantage of computer technology to inform you of the latest worldwide, aerospace-related, scientific and technical information that has been published.

No more waiting while the paper copy is printed and mailed to you. You can view *Electronic SCAN* the same day it is released—up to 191 topics to browse at your leisure. When you locate a publication of interest, you can print the announcement. You can also go back to the *Electronic SCAN* home page and follow the ordering instructions to quickly receive the full document.

Start your access to *Electronic SCAN* today. Over 1,000 announcements of new reports, books, conference proceedings, journal articles...and more—available to your computer every two weeks.

**Timely  
Flexible  
Complete  
FREE!**

For Internet access to *E-SCAN*, use any of the following addresses:

<http://www.sti.nasa.gov>

[ftp.sti.nasa.gov](ftp://sti.nasa.gov)

[gopher.sti.nasa.gov](mailto:gopher.sti.nasa.gov)

To receive a free subscription, send e-mail for complete information about the service first. Enter **scan@sti.nasa.gov** on the address line. Leave the subject and message areas blank and send. You will receive a reply in minutes.

Then simply determine the *SCAN* topics you wish to receive and send a second e-mail to **listserve@sti.nasa.gov**. Leave the subject line blank and enter a subscribe command in the message area formatted as follows:

**Subscribe <desired list> <Your name>**

For additional information, e-mail a message to **help@sti.nasa.gov**.

Phone: (301) 621-0390

Fax: (301) 621-0134

Write: NASA Access Help Desk  
NASA Center for AeroSpace Information  
800 Elkridge Landing Road  
Linthicum Heights, MD 21090-2934

## **Looking just for *Aerospace Medicine and Biology* reports?**

Although hard copy distribution has been discontinued, you can still receive these vital announcements through your *E-SCAN* subscription. Just **subscribe SCAN-AEROMED** in the message area of your e-mail to **listserve@sti.nasa.gov**.



# Table of Contents

Records are arranged in categories 51 through 55, the Life Sciences division of *STAR*. Selecting a category will link you to the collection of records cited in this issue pertaining to that category.

<b>51</b>	<b>Life Sciences (General)</b>	<b>1</b>
<b>52</b>	<b>Aerospace Medicine</b>	<b>4</b>
	Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.	
<b>53</b>	<b>Behavioral Sciences</b>	<b>9</b>
	Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.	
<b>54</b>	<b>Man/System Technology and Life Support</b>	<b>10</b>
	Includes human engineering; biotechnology; and space suits and protective clothing.	
<b>55</b>	<b>Space Biology</b>	<b>N.A.</b>
	Includes exobiology; planetary biology; and extraterrestrial life.	

## Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also view the indexes provided, for searching on *NASA Thesaurus* subject terms and author names.

<b>Subject Term Index</b>	<b>ST-1</b>
---------------------------	-------------

<b>Author Index</b>	<b>PA-1</b>
---------------------	-------------

Selecting an index above will link you to that comprehensive listing.

## Appendix

Select **Appendix** for important information about NASA Scientific and Technical Information (STI) Office products and services, including registration with the NASA Center for AeroSpace Information (CASI) for access to the NASA CASI TRS (Technical Report Server), and availability and pricing information for cited documents.

# Typical Report Citation and Abstract

**DOCUMENT ID NUMBER** → **19960021053** NASA Langley Research Center, Hampton, VA USA. ← **CORPORATE SOURCE**

**TITLE** → **An Extended Compact Tension Specimen for Fatigue Crack Propagation and Fracture**

**AUTHORS** → Piascik, R. S., NASA Langley Research Center, USA; Newman, J. C., Jr., NASA Langley Research Center, USA; ← **AUTHORS' AFFILIATION**

**PUBLICATION DATE** → Mar. 1996, pp. 16; In English

**CONTRACTS/GRANTS** → Contract(s)/Grant(s): RTOP 538-02-10-01

**REPORT NO.(S)** → Report No.(s): NASA-TM-110243; NAS 1.15:110243; No Copyright; Avail: CASI A03, Hardcopy; A01, Microfiche ← **AVAILABILITY AND PRICE CODE**

**ABSTRACT** → developed for fatigue and fracture testing. Documented herein are stress-intensity factor and compliance expressions for the EC(T) specimen.

**ABSTRACT AUTHOR** → Author

**SUBJECT TERMS** → *Crack Propagation; Stress Intensity Factors; Fatigue (Materials)*

---

# AEROSPACE MEDICINE AND BIOLOGY

---

*A Continuing Bibliography (Suppl. 425)*

OCTOBER 28, 1996

51

## LIFE SCIENCES (GENERAL)

**19960042909** Atomic Energy Control Board, Ottawa, Ontario Canada

### **Effects of ionizing radiation on the boreal forest**

Amiro, B. D., Atomic Energy of Canada Ltd., Canada; Aug. 1995; 80p; In English

Contract(s)/Grant(s): AECB-7.168.1

Report No.(s): INFO-0581; DE96-620446; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The Field-Irradiator-Gamma (FIG) project chronically exposed a section of the boreal forest to ionizing radiation by placing a (sup 137)Cs source on top of a 20-m tower at a forest site in southeastern Manitoba. The irradiation continued from 1973 to 1986 and the forest was exposed to radiological dose rates ranging from 65 mGy.h(sup -1) to 0.005 mGy.h(sup -1) along a gradient extending 500 m from the source. The irradiation killed the tree canopy close to the irradiator, resulting in the formation of a herbaceous zone of vegetation at high dose rates. After 14 years of irradiation, some tree species were still being affected at dose rates as low as about 1 mGy.h(sup -1). The data gathered at the FIG site can be used to identify radiological dose rates that forest communities can tolerate. This information allows decisions to be made concerning guidelines for protection of the general environment from radionuclide emissions from various anthropogenic sources, such as nuclear reactors and uranium tailings. This report reviews the previous data collected at the FIG site during the pre-irradiation and irradiation phases and the methodology used to establish a baseline for future comparisons. Permanently marked sampling plots are a particular strength to the study, whereby researchers can compare the present forest community with that measured during the past 25 years.

Author (DOE)

*Canopies (Vegetation); Ionizing Radiation; Forests; Radiation Dosage; Irradiation; Radiation Effects; Timber Vigor; Time Functions*

**19960044557** Centro de Estudios Aplicados al Desarrollo Nuclear, La Habana, Cuba

### **System for the analysis of plant chromosomes Sistema**

### ***para el analisis de cromosomas de plantas***

Medina Martin, D., Centro de Estudios Aplicados al Desarrollo Nuclear, Cuba; Peraza Gonzalez, L. H., Centro de Estudios Aplicados al Desarrollo Nuclear, Cuba; 1996; 13p; In Spanish Report No.(s): CIEN-R-14-96; DE96-623091; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The paper describes a computer system for the automation workers of recognition analysis and interpretation of plant chromosomes. This system permit to carry out the analysis in a more comfortable and faster way, using the image processing techniques.

DOE

*Computer Programs; Image Processing; Chromosomes; Data Processing; Plants (Botany)*

**19960045237** NASA Washington, Washington, DC USA

### **The 1992-1993 NASA Space Biology Accomplishments**

Halstead, Thora W., Editor, NASA Washington, USA; Oct. 1994; 328p; In English

Report No.(s): NASA-TM-4711; NAS 1.15:4711; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

This report consists of individual technical summaries of research projects of NASA's Space Biology Program, for research conducted during the calendar years of 1992 and 1993. This program includes both plant and animal research, and is dedicated to understanding the role of gravity and the effects of microgravity on biological processes; determining the effects of the interaction of gravity and other environmental factors on biological systems; and using the microgravity of the space environment as a tool to advance fundamental scientific knowledge in the biological sciences to improve the quality of life on Earth and contribute to NASA's goal of manned exploration of space. The summaries for each project include a description of the research, a list of the accomplishments, an explanation of the significance of the accomplishments, and a list of publications.

Author

*Microgravity; Aerospace Environments; Gravitational Effects; Life Sciences; Biological Effects*

**19960045289** Bionetics Corp., Cocoa Beach, FL USA  
**Oxygen Consumption of Tilapia and Preliminary Mass**

**Flows through a Prototype Closed Aquaculture System**  
Muller, Matthew S., Bionetics Corp., USA; Bauer, Clarence F., Bionetics Corp., USA; Jun. 1994; 30p; In English  
Contract(s)/Grant(s): NAS-10-11624

Report No.(s): NASA-TM-111882; NAS 1.15:111882; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Performance of NASA's prototype CELSS Breadboard Project Closed Aquaculture System was evaluated by estimating gas exchange quantification and preliminary carbon and nitrogen balances. The total system oxygen consumption rate was 535 mg/hr kg/fish (cv = 30%) when stocked with *Tilapia aurea* populations (fresh weights of 97 +/- 19 to 147 +/- 36 g/fish for various trials). Oxygen consumption by *T. aurea* (260 mg/hr kg/fish) contributed to approximately one-half of total system demand. Continuous carbon dioxide quantification methods were analyzed using the relation of carbon dioxide to oxygen consumption. Overall food conversion rates averaged 18.2 +/- 3.2%. Major pathways for nitrogen and carbon in the system were described with preliminary mass closure of 60-80% and 60% for nitrogen and carbon.

Author

*Aquiculture; Oxygen Consumption; Mass Flow; Closed Ecological Systems; Gas Exchange; Marine Biology; Carbon Dioxide*

**19960045333** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA USA

**Adaptive response of slow and fast skeletal muscle in the monkey to spaceflight Final Report**

Bodine-Fowler, Sue, California Univ., USA; Jun. 03, 1996; 11p; In English

Contract(s)/Grant(s): NAG2-714

Report No.(s): NASA-CR-202120; NAS 1.26:202120; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experiments were designed to determine the effects of the absence of weight support on hindlimb muscles of the monkey: an ankle flexor (tibialis anterior, TA), two ankle extensors (medial gastrocnemius, MG and soleus, SOL), and a knee extensor (vastus lateralis, VL). These experiments will be performed as part of the BION mission. The original project proposed to assess the effects of weightlessness in adult Rhesus monkeys which were to be flown on the Space Shuttle as part of SLS-3. Feasibility studies were carried out and a series of experiments were performed at NASA/Ames Research Center to assess the effects of a 21-day restraint period in the ESOP on muscle properties. The results of these studies are summarized.

CASI

*Muscles; Atrophy; Responses; Monkeys; Weightlessness; Metabolism; Tissues (Biology); Spaceborne Experiments*

**19960045412** Department of the Navy, Washington, DC USA

**Liposomes Containing Polymerized Lipids for Non-Covalent Immobilization of Proteins and Enzymes**

Singh, Alok, Inventor, Department of the Navy, USA; Nov. 14, 1995; 19p; In English; Supersedes AD-D288234

Patent Info.: US-Patent-Appl-SN-220124; US-Patent- 5,466,467  
Report No.(s): AD-D017951; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The lipids of this invention are derivatives of phosphatidyl choline having the general chemical formula with: at least one polymerizable unsaturated alkyl group, acid or ester; and an iminodiacetic acid in the polymerizable metal chelating lipid. Lipid microstructures are formed by mixing the polymerizable metal chelating lipid monomers with polymerizable non-chelating lipid monomers (for example, N1(CH3)3). DTIC

*Lipids; Enzymes; Polymerization; Proteins*

**19960045623** Minnesota Mining and Mfg. Co., Wound Management Products Lab., Saint Paul, MN USA

**Hemostatic Activity of Chitosan in Wound Management Final Report**

Jan. 31, 1996; 9p; In English

Contract(s)/Grant(s): N00014-89-C-0024

Report No.(s): AD-A304249; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The hemostatic activity of chitosan was first reported by Malette and Quigley. Olsen et al completed initial preclinical safety and efficacy studies on several physical terms of various chitosan salts and also elegant experiments which defined a possible mechanism for coagulum formation. Based on this work, it appeared that an ionic interaction between the positively charged chitosan polymer and the negatively charged cell membrane of the red blood cell was responsible for coagulum formation. This mechanism can operate independently of the normal blood coagulation cascade which results in fibrin formation; that is, chitosan can form a stable coagulum with blood in the absence of fibrin. In vitro experiments have demonstrated that blood treated with heparin, which inhibits fibrin formation, forms a stable coagulum when aqueous solutions of chitosan salts are added. Addition of solid chitosan salts had no effect on heparinized blood under the same conditions. The observation that stable coagula could be formed with heparinized blood and chitosan salt solutions generated considerable interest in the possibility of using chitosan as a clinical hemostatic agent. Since all commercially available hemostat agents depend ultimately on the formation of fibrin, chitosan offered the opportunity for a truly differentiated product. A hemostatic agent which functioned independently or the normal blood clotting cascade would be useful in cases where fibrin formation was inhibited pharmaceutically (hepa-



rin or other anticoagulation therapy) or due to some other coagulopathy.

DTIC

*Blood Coagulation; Wound Healing; Erythrocytes; Hemostatics; Fibrin; Heparins*

**19960045974**

**Large strain analysis of soft biological membranes: Formulation and finite element analysis**

Holzapfel, Gerhard A., Stanford Univ, USA; Eberlein, Robert; Wriggers, Peter; Weizsacker, Hans W.; Computer Methods in Applied Mechanics and Engineering; May 15 1996; ISSN 0045-7825; vol. 132, no. 1-2, pp. 45-61; In English; Copyright; Avail: Issuing Activity

This paper presents a general formulation of thin incompressible membranes and investigates the behavior of soft biotissues using the finite element method. In particular the underlying hyperelastic model is chosen to examine the highly non-linear constitutive relation of blood vessels which are considered to be perfectly elastic, homogeneous and (nearly) incompressible. First, the stress-deformation relation and the elastic tangent moduli are derived in a very general material setting which is subsequently specified for blood vessels in terms of Green-Lagrangian strains. Based on the principle of virtual work the finite element equations are provided and briefly discussed. Consistent linearization of the weak form of equilibrium and the external pressure term ensures a quadratic convergence rate of the iterative solution procedure. On the computational side of this work an effort was undertaken to show a novel approach on the investigation of soft tissue biomechanics. Representative numerical analyses of problems in vascular mechanics are discussed that show isochoric finite deformations (large rotations and large strains). In particular, a numerical simulation of the interaction between an inflated balloon catheter and a plaque deposit on the wall of a blood vessel is presented.

Author (EI)

*Biodynamics; Cardiovascular System; Deformation; Elastic Properties; Lagrangian Function; Membranes; Strain Distribution; Tissues (Biology)*

**19960046126**

**Combined influence of interfacial reaction resistance and fluid flow on microelectrode sensors**

Verbrugge, Mark W., General Motors Research and Development Cent, USA; Baker, Daniel R.; Journal of the Electrochemical Society; July 1996; ISSN 0013-4651; vol. 143, no. 7, pp. 2252-2258; In English; Copyright; Avail: Issuing Activity

The influence of convection and interfacial-reaction resistance on the response of microsensors, including the effects of: (i) fluid flow rates; (ii) reactant (to be sensed) concentration and diffusion coefficient; (iii) fluid conduit and microsensor size; and (iv) sensor potential and interfacial-reaction

resistance, are clarified. For steady-state convective diffusion to a microdisk sensor, it is shown that sensor response is a monotonic function of two dimensionless groups: the Peclet number  $Pe$ , which characterizes the magnitude of convective transport relative to that of diffusion, and the group  $\tan(\theta)$ , which provides a measure of diffusive-transport resistance relative to that of the interfacial charge-transfer reaction. A singular-perturbation solution provides the sensor response vs.  $Pe$  and  $\theta$  for small  $Pe$ , corresponding to slow fluid flows and small disks, and numerical calculations extend the analysis to higher  $Pe$  values. The analysis suggests a method for increasing the signal-to-noise ratio through altering the sensor bias potential.

Author (EI)

*Composition (Property); Electrochemistry; Electrodes; Fluid Flow; Interfaces; Peclet Number*

**19960046849**

**Steerable microcatheters actuated by embedded conducting polymer structures**

Santa, A. Della, Univ of Pisa, Italy; Mazzoldi, A.; De Rossi, D.; Journal of Intelligent Material Systems and Structures; May 1996; ISSN 1045-389X; vol. 7, no. 3, pp. 292-300; In English; Copyright; Avail: Issuing Activity

Steerable microstructures, i.e., catheters, are presented. They exploit the electromechanochemical phenomena of  $\pi$ -electron conjugated conducting polymers occurring when ionic species are exchanged with the surrounding medium. In this paper we considered polypyrrole as conducting polymer and a fast ionic conductor solid polyelectrolyte as ionic reservoir. Experimental determination of the governing material constants, modelling of conducting polymer/solid polyelectrolyte composite material and finite element computer simulations of the mechanical properties of cylindrical structures provide favourable indication about the feasibility of effective steerable, miniaturised catheters.

Author (EI)

*Catheterization; Conducting Polymers; Conductors; Electrolytes; Ion Exchanging; Medical Equipment; Organic Compounds*

**19960049411**

**Combined MRI-PET scanner: a Monte Carlo evaluation of the improvements in PET resolution due to the effects of a static homogeneous magnetic field**

Raylman, Raymond R., West Virginia Univ, USA; Hammer, Bruce E.; Christensen, Nelson L.; IEEE Transactions on Nuclear Science; August 1996; ISSN 0018-9499; vol. 43, no. 4, pt. 2, pp. 2406-2412; In English; In English; Copyright; Avail: Issuing Activity

Positron emission tomography (PET) relies upon the detection of photons resulting from the annihilation of positrons emitted by a radiopharmaceutical. The combination of images obtained with PET and magnetic resonance imaging

(MRI) have begun to greatly enhance the study of many physiological processes. A combined MRI-PET scanner could alleviate much of the spatial and temporal coregistration difficulties currently encountered in utilizing images from these complementary imaging modalities. In addition, the resolution of the PET scanner could be improved by the effects of the magnetic field. In this computer study, the utilization of a strong static homogeneous magnetic field to increase PET resolution by reducing the effects of positron range and photon noncollinearity was investigated. The results reveal that significant enhancement of resolution can be attained. For example, an approximately 27% increase in resolution is predicted for a PET scanner incorporating a 10-Tesla magnetic field. Most of this gain in resolution is due to magnetic confinement of the emitted positrons. Although the magnetic field does mix some positronium states resulting in slightly less photon noncollinearity, this reduction does not significantly affect resolution. Photon noncollinearity remains as the fundamental limiting factor of large PET scanner resolution. Author (EI)

*Imaging Techniques; Magnetic Resonance; Medical Equipment; Plasma Control; Positrons; Tomography*

**19960049555**

#### **Algorithms to identify detector Compton scatter in PET modules**

Comanor, K. A., Univ of California, USA; Virador, P. R. G.; Moses, W. W.; IEEE Transactions on Nuclear Science; August 1996; ISSN 0018-9499; vol. 43, no. 4, pt. 1, pp. 2213-2218; In English; In English; Copyright; Avail: Issuing Activity

Using Monte Carlo simulation, we investigate algorithms to identify and correct for detector Compton scatter in hypothetical PET modules with 3 x 3 x 30 mm BGO crystals coupled to individual photosensors. Rather than assume a particular design, we study three classes of detectors: (1) with energy resolution limited by counting statistics, (2) with energy resolution limited by electronic noise, and (3) with depth of interaction (DOI) measurement capability. For the first two classes, selecting the channel with the highest signal as the crystal of interaction yields a 22-25% misidentification fraction (MIF) for all reasonable noise fwhm to signal (N/S) ratios (i.e. less than 0.5 at 511 keV). Algorithms that attempt to correctly position events that undergo forward Compton scatter using only energy information can reduce the MIF to 12%, and can be easily realized with counting statistics limited detectors but can only be achieved with very low noise values for noise limited detectors. When using position of interaction to identify forward scatter, a MIF of 12% can be obtained if the detector has good energy and position resolution.

Author (EI)

*Algorithms; Compton Effect; Computerized Simulation; Electron Scattering; Light Scattering; Monte Carlo Method; Photometers; Positrons; Tomography*

**19960049561**

#### **Estimation of the noise contributions from blank, transmission and emission scans in PET**

Holm, Soren, Natl Univ, Denmark; Toft, Peter; Jensen, Mikael; IEEE Transactions on Nuclear Science; August 1996; ISSN 0018-9499; vol. 43, no. 4, pt. 1, pp. 2285-2291; In English; In English; Copyright; Avail: Issuing Activity

This work determines the relative importance of noise from blank (B), transmission (T) and emission (E) scans in PET using a GE Advance scanner on a 20 cm cylinder, a brain phantom, and a torso-like ellipse (18/35 cm) with examples of human scans (brain O-15 water and F-18 FDG, heart FDG). Phantom E scans were acquired in both 2D and 3D modes as decay series with C-11 or F-18 over 3-6 decades of Noise Equivalent Counts (NEC). B and T scans were made using two pin sources (approximately = 500 MBq total) over 64-32768 sec. In humans only a limited subset was available. In homogeneous phantoms normalized variance (var) was estimated from pixel distributions in single images. In other objects, including the human studies, calculations were performed on differences of paired images. In all cases a fit was made to a simple noise model. The cylinder data show expected relations of T to B noise proving the adequacy of B scan times less than or = 20 min for most purposes. For the brain phantom, a contour plot is provided for var(E,T). In a typical 3D O-15 water study with 0.5M counts per central slice, a 10 min T-scan adds less than 10% to the total noise level. An example shows how to split a total scan time between E and T scans, in order to minimize the variance.

Author (EI)

*Electromagnetic Wave Transmission; Image Reconstruction; Parameter Identification; Positrons; Random Signals; Tomography; Wave Attenuation*

## **52 AEROSPACE MEDICINE**

*Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.*

**19960042692** Lawrence Livermore National Lab., Livermore, CA USA

#### **Laser tissue welding mediated with a protein solder**

Small, Ward, IV, Lawrence Livermore National Lab., USA; Heredia, Nicholas J., Lawrence Livermore National Lab., USA; Celliers, Peter M., Lawrence Livermore National Lab., USA; DaSilva, Luiz B., Lawrence Livermore National Lab., USA; Eder, David C., Lawrence Livermore National Lab., USA; Glinsky, Michael E., Lawrence Livermore National Lab., USA; London, Richard A., Lawrence Livermore National Lab., USA; Maitland, Duncan J., Lawrence Livermore National Lab., USA; Matthews, Dennis L., Lawrence Livermore National Lab., USA; Soltz, Barbara A., Conversion Energy Enterprises, USA; Feb. 1996; 11p; In English; Society of

Photo-Optical Instrumentation Engineers 1996 Conference, 28 Jan. - 2 Feb. 1996, San Jose, CA, USA

Contract(s)/Grant(s): W-7405-eng-48

Report No.(s): UCRL-JC-124046; CONF-960163-34; DE96-012230; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A study of laser tissue welding mediated with an indocyanine green dye-enhanced protein solder was performed. Freshly obtained sections of porcine artery were used for the experiments. Sample arterial wall thickness ranged from two to three millimeters. Incisions approximately four millimeters in length were treated using an 805 nanometer continuous-wave diode laser coupled to a one millimeter diameter fiber. Controlled parameters included the power delivered by the laser, the duration of the welding process, and the concentration of dye in the solder. A two-color infrared detection system was constructed to monitor the surface temperatures achieved at the weld site. Burst pressure measurements were made to quantify the strengths of the welds immediately following completion of the welding procedure.

DOE

*Arteries; Medical Science; Biological Effects; Tissues (Biology); Proteins; Continuous Wave Lasers*

**19960042725** Science Applications International Corp., McLean, VA USA

**An Epidemiologic Investigation of Health Effects in Air Force Personnel Following Exposure to Herbicides. Volume 7**

Grubbe, William D., Science Applications International Corp., USA; Wolfe, William H., Armstrong Lab., USA; Michalek, Joel E., Armstrong Lab., USA; Williams, David, Science Applications International Corp., USA; Lustik, Michael B., Science Applications International Corp., USA; May 02, 1995; 415p; In English

Contract(s)/Grant(s): F41624-91-C-1006

Report No.(s): AD-A304309; AL-TR-920107-VOL-7; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

Topic considered include: The Dioxin Assay, Questionnaire Methodology, Physical Examination Methodology, Study Selection and Participation, Quality Control, Statistical Methods, Covariate Associations with Estimates of Dioxin Exposure, General Health Assessment - Neoplasia, Assessment - Neurological, Assessment - Psychological, Assessment - Gastrointestinal, Assessment - Dermatologic, Assessment - Cardiovascular, Assessment - Hematologic, Renal Assessment, Endocrine Assessment, Immunologic Assessment, Pulmonary Assessment, To collect blood samples for dioxin testing in accordance with Center for Disease Control standards.

DTIC

*Clinical Medicine; Herbicides; Public Health*

**19960042784** Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Human Factors Research Inst., Soesterberg, Netherlands

**Ship Motions and 'Motion Sickness Incidence' (MSI): Estimates of the Percentage Sick People Based on Vertical Motion *Scheepsbewegingen en 'Motion Sickness Incidence' (MSI): Voorspellingen van het percentage bewegingszieken op basis van verticale bewegingen***

Bos, J. E., Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands; Nov. 28, 1995; 18p; In Dutch Contract(s)/Grant(s): A95/KM/358; Proj. 789.3

Report No.(s): TNO-TM 1995 A-71; TD 95-1489; Copyright; Avail: Issuing Activity (TNO Human Factors Research Institute, Kampweg 5, 3769 DE Soesterberg, Netherlands), Hardcopy, Microfiche

Ship motions can induce seasickness. Especially the vertical movements with frequencies below 1 Hz are very provocative. This report gives a summary and a description of a computer-implementation of a model formulated by McCauley et al. (1976), and a model by Griffin (1990), to predict the percentage of sick people given a motion time history.

Author

*Vertical Motion; Motion Sickness; Ships; Coriolis Effect; Mathematical Models*

**19960042879** Science Applications International Corp., McLean, VA USA

**An Epidemiologic Investigation of Health Effects in Air Force Personnel Following Exposure to Herbicides, Volume 8**

Grubbe, William D., Science Applications International Corp., USA; Wolfe, William H., Armstrong Lab., USA; Michalek, Joe E., Armstrong Lab., USA; Williams, David E., Science Applications International Corp., USA; Lustik, Michael B., Science Applications International Corp., USA; May 02, 1995; 435p; In English

Contract(s)/Grant(s): F41624-91-C-1006; SAIC Proj. 01-0813-02-3005

Report No.(s): AD-A304316; AL-TR-920107-Vol-8; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

Discussion of Vibrotactile Threshold Methodology and Dependent Variable-Covariate Associations for the Neurology Assessment, Interaction Tables for the Neurology Assessment, Neurology Analysis Tables-Occupation and Diabetic Class Removed from Final Model, Interaction Tables for the Neurology Assessment, Occupation and Diabetic Class Removed from Final Model, Primary symptom Disease Categories and Global Indices of Distress Definitions and Dependent Variable-Covariate Associations for the Psychological Assessment, Interaction Tables for the Psychological Assessment, Psychology Analysis Tables-Occupation Removed from Final Model, Interaction Tables for the Psychological Assessment-Occupation Removed from Final Model, Dependent Variable-Covariate Associations for Gastrointestinal As-

essment, Interaction Tables for the Gastrointestinal Assessment, Gastrointestinal Analysis Tables-Occupation Removed from Final Model, Interaction Tables for the Gastrointestinal Assessment, Occupation Removed from Final Model.

DTIC

*Public Health; Armed Forces (USA); Gastrointestinal System*

**19960042932** Iowa Univ., Depts. of Psychology and Pharmacology and the Cardiovascular Center., Iowa City, IA USA  
**Role of lateral parabrachial nucleus in the inhibition of water intake produced by right atrial stretch**

Ohman, Lynne E., Iowa Univ., USA; Jul. 11, 1995; ISSN 0006-8993; 8p; Repr. from Brain Research (Elsevier Science B. V.), v. 695, 1995 p 275-278; In English  
Contract(s)/Grant(s): NAGw-4358; HL-14338; HL-44546  
Report No.(s): NASA-CR-201818; NAS 1.26:201818; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

Rats with either bilateral electrolytic or sham lesions of the ventrolateral portion of the lateral parabrachial nucleus (VLLPBN) were implanted with latex balloons that lay at the right superior vena cava/atrial junction (RSVC/AJ). Water intake in response to isoproterenol was measured both with and without inflation of the balloon. Water intake of the sham-lesioned rats was significantly depressed by balloon inflation during the first hour of the experiment. In contrast, water intake in the VLLPBN-lesioned rats was unaffected by balloon inflation. These results suggest that the VLLPBN is involved in the processing of afferent input from stretch-activated RSVC/AJ receptors.

Author

*Balloons; Rats; Lesions; Vasoconstriction; Veins; Drinking; Body Fluids; Water*

**19960042961** McMaster Univ., Hamilton, Ontario Canada  
**Proceedings of the international hypoxia symposium on hypoxia and the brain Final Report, 21 Feb. - 20 Aug. 1995**  
Sutton, John R., Editor, Sydney Univ., Australia; Houston, Charles S., Principal Investigator, Vermont Univ., USA; Coates, Geoffrey, Editor, McMaster Univ., Canada; Jan. 19, 1996; 367p; In English; 9th, 14-18 Feb. 1995, Lake Louise, Canada

Contract(s)/Grant(s): DAMD17-95-1-5028

Report No.(s): AD-A303727; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

These proceedings include papers on: the brain and hypoxia; the comparative physiology of respiratory pigments; the Haldane-Barcroft debate; fetal development; Monges disease; mountain medicine; and biodiversity.

Derived from text

*Conferences; Hypoxia; Brain Damage; Oxygen Consumption; Hypoxemia; Altitude Acclimatization; Altitude Sickness; Fetuses; Biological Diversity; Aeroembolism*

**19960042975** Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte, Brazil

**Utilization of hair and nails as bio-indicators of contamination by heavy and toxic metals in industrial workers Utilizacao de cabelos e unhas como bioindicadores de contaminacao por metais pesados e toxicos em trabalhadores de industrias**

deVilhena Schayer Sabino, Claudia, Centro de Desenvolvimento da Tecnologia Nuclear, Brazil; Silva, Ascanio Barros F. E., Centro de Desenvolvimento da Tecnologia Nuclear, Brazil; Fernandes, Marcio Prado, Centro de Desenvolvimento da Tecnologia Nuclear, Brazil; Amaral, Angela Maria, Centro de Desenvolvimento da Tecnologia Nuclear, Brazil; Franco, Milton Batista, Centro de Desenvolvimento da Tecnologia Nuclear, Brazil; Guedes, Joao Bosco, Centro de Desenvolvimento da Tecnologia Nuclear, Brazil; Francisco, Dovenir, Centro de Desenvolvimento da Tecnologia Nuclear, Brazil; deCastro de Assis, Adilson, Centro de Desenvolvimento da Tecnologia Nuclear, Brazil; [1996]; 7p; In Portuguese

Report No.(s): INIS-BR-3590; DE96-616654; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Instrumental neutron activation analysis and atomic absorption spectrometry were performed on scalp hair and fingernail samples collected from a group of heavily exposed healthy mail industrial workers. The concentration of trace elements (As, Cd, Cr, Hg, Ni, Pb and Sb) were evaluated and compared for scalp and fingernails. Comparative studies demonstrated that concentration of certain elements were greater than those corresponding to non-exposed workers.

DOE

*Absorption Spectroscopy; Hair; Neutron Activation Analysis; Toxicity; Trace Elements*

**19960042999** Kyoto Univ., Research Reactor Inst., Osaka, Japan

**Development of a filtered neutron field in KUR: In behalf of biological irradiation experiments**

Sato, Takashi, Editor, Kyoto Univ., Japan; Utsuro, Masahiko, Editor, Kyoto Univ., Japan; Utsumi, Hiroshi, Editor, Kyoto Univ., Japan; Jul. 1995; 65p; In Japanese

Report No.(s): KURRI-TR-409; DE96-741939; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Very little direct measurements have been made of the biological effects of neutrons below 100keV. Recently, an iron-filtered 24keV neutron beam of Harwell Materials Testing Reactor, PLUTO, was reported to be highly efficient in inducing chromosome aberrations; the efficiency being comparable to that of fission neutrons. These results could have serious

repercussions for radiation protection standards as the ICRP assume a decrease in neutron RBE below 100keV. The investigations reported here have as their primary purpose the production of neutron beams at the 24keV iron window energy, using the B-1 experimental facility of the Kyoto University Research Reactor (KUR) at the Research Reactor Institute, Kyoto University (KURRI). The filtered neutron field for biomedical applications is designed to maximize the contributions of neutrons with other energies and gamma-rays. The characteristics of the radiation field were obtained by the simple transmission calculations for Fe(45cm) and Al(35cm) filters, by using the Monte Carlo code MCN P, and by the measurement of nuclear heating for Fe and Al filter pieces. The 24keV neutron flux and gamma-ray dose rate were measured using a proton recoil counter and TLDs, respectively. The measured findings are as follows: The 24keV neutron flux at the irradiation field was approximately  $1 \times 10^{10}$  (exp 6)n/sq cm/s, and the gamma-ray dose rate was 1.0Gy/h at the surface of the B-1 plug. Nuclear heating of the filter materials was 5.2mW/g for Fe and 4mW/g for Al, in maximum.

DOE

*Biological Effects; Chromosomes; Aberration; Neutron Beams; Radiation Distribution; Relative Biological Effectiveness (RBE)*

**19960043023** Atomic Energy Control Board, Ottawa, Ontario Canada

#### **Improved cytometry**

McLean, J.R.N., Health Canada, Canada; Sep. 1995; 22p; In English

Contract(s)/Grant(s): AECB-7.164.2

Report No.(s): INFO-0589-2; DE96-620455; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One shortcoming of biological dosimetry based on the detection and quantitation of chromosome aberrations, is the labor intensive nature of the analysis. State-of-the-art imaging software cannot recognize the wide variety of shapes that can be assumed by dicentric chromosomes nor the algorithms available to accommodate translocation analysis. In this project, relatively simple computer routines have been used to reduce the time necessary to perform the repetitive tasks associated with radiation dosimetry. Repetitive tasks that can be computerized include data reduction and collation, verification of the number of chromosomes in each metaphase spread and, with the help of a motorized microscope stage and computer-assisted focus control, the automated location of metaphase chromosome spreads. The task of automated metaphase location is addressed in this project. The tasks of data reduction and computer-assisted chromosome counting have been addressed in a previous report to the Atomic Energy Control Board (AECB) research project no.7.164.1. The preliminary evaluation of the performance of the metaphase finder, indicates a false positive rate of less than or equal to 7% and a false negative rate of less than or equal to 23%, using a limit-

ed data set of 1289 events and threshold values at 25, 26, 27, or 28. Over the 4 threshold levels, the average system sensitivity was calculated to be 75% and positive predictability to be 85%. Sensitivity is the fraction of real events which are correctly detected, and positive predictability, the fraction of detections which are real events. In a perfect detector, these values would be 100%.

Author (DOE)

*Algorithms; Chromosomes; Computer Techniques; Cytometry; Imaging Techniques; Radiation Dosage; Lymphocytes; Mitosis*

**19960044489** Department of Energy, Assistant Secretary for Environment, Safety and Health; Off. of Human Radiation Experiments., Washington, DC USA

#### **Human radiation studies: Remembering the early years: Oral history of hematologist Karl F. Hubner, M.D., December 30, 1994**

Sep. 1995; 40p; In English

Report No.(s): DOE/EH-0470; DE96-009855; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report is a transcript of an interview of Dr. Karl F. Hubner by representatives of the US DOE Human Radiation Experiments. Dr. Hubner was selected for this interview because of his participation in the Oak Ridge Institute of Nuclear Studies(ORINS)/Oak Ridge Associated Universities(ORAU) Medical Division cancer therapy research program involving total body irradiation. After a short biographical sketch Dr. Hubner discusses his research in Bone Marrow Transplants, his participation in the development of Nuclear Medicine in Oak Ridge, use of the total body irradiation machine at the University of Tennessee School of Agriculture Animal Research Laboratory (later the Comparative Animal Research Laboratory or CARL) to deliver a high enough dose rate to destroy a patient's immune system, the operation of a sterile environment for recovery of patients following bone-marrow transplantation, and the closing of the ORAU Medical Division's Clinical Program following a negative review. Finally, Dr. Hubner describes his later research using PET.

DOE

*Bone Marrow; Cancer; Medical Science; Nuclear Medicine; Transplantation; Dosage; Therapy; Biography*

**19960044583** Atomic Energy Control Board, Ottawa, Ontario Canada

#### **A survey of research programs in radiation protection in Canada**

Jul. 1995; 72p; In English; In French

Report No.(s): INFO-0574; AC-4; DE96-621296; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

A survey of research programs in Canada concerned with radiation protection was conducted in 1991-92 by the Joint Subcommittee on Regulatory Research (JSCRR) of the

Atomic Energy Control Board (AECB) Advisory Committees on Radiological Protection and on Nuclear Safety. The purpose of this survey was to determine the current state of funding for this type of research in Canada. Funding for health-related radiation research in Canada is critical to establishing and maintaining a supply of trained professionals who can provide competent advice on health-related problems in radiation protection. The present report is an analysis of the information received in this survey. This survey concludes with the recommendation that the organization and definition of subprograms for the AECB Regulatory Research and Support Program should be completed as soon as possible. In this report the JSCRR should assist AECB staff in preparing a report in which priorities for research related to radiation protection are indicated. The sources of information noted at the end of the discussion section of this report should be considered for this purpose.

DOE

*Nuclear Electric Power Generation; Radiation Protection; Canada; Research*

**19960044614** Indiana Univ. Medical Center, Dept. of Orthopaedic Surgery., Indianapolis, IN USA

**Modulation of bone remodeling via mechanically activated ion channels *Final Report, 1 May 1992 - 31 Dec. 1994***

Duncan, Randall L., Principal Investigator, Indiana Univ. Medical Center, USA; 1996; 102p; In English  
Contract(s)/Grant(s): NAG2-791; NAG2-1049

Report No.(s): NASA-CR-201909; NAS 1.26:201909; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A critical factor in the maintenance of bone mass is the physical forces imposed upon the skeleton. Removal of these forces, such as in a weightless environment, results in a rapid loss of bone, whereas application of exogenous mechanical strain has been shown to increase bone formation. Numerous flight and ground-based experiments indicate that the osteoblast is the key bone cell influenced by mechanical stimulation. Aside from early transient fluctuations in response to unloading, osteoclast number and activity seem unaffected by removal of strain. However, bone formation is drastically reduced in weightlessness and osteoblasts respond to mechanical strain with an increase in the activity of a number of second messenger pathways resulting in increased anabolic activity. Unfortunately, the mechanism by which the osteoblast converts physical stimuli into a biochemical message, a process we have termed biochemical coupling, remains elusive. Prior to the application of this grant, we had characterized a mechanosensitive, cation nonselective channel (SA-cat) in osteoblast-like osteosarcoma cells that we proposed is the initial signalling mechanism for mechanotransduction. During the execution of this grant, we have made considerable progress to further characterize this channel as well as to determine its role in the osteoblastic response to mechanical strain. To achieve these goals, we combined electrophysiologic tech-

niques with cellular and molecular biology methods to examine the role of these channels in the normal function of the osteoblast in vitro.

Derived from text

*Biochemistry; Bones; Bone Demineralization; Physiological Responses; Transient Response*

**19960044665** Maria Skłodowska-Curie Polish Radiation Research Society, Warsaw, Poland

**The 10th National Conference of Maria Skłodowska-Curie Polish Radiation Research Society. Abstract of papers 10. krajowy zjazd Polskiego Towarzystwa Badan Radiacyjnych im. Marii Skłodowskiej-Curie. Streszczenia referatów**

1995; 157p; In Polish; 10th; National Conference of Maria Skłodowska-curie Polish Radiation Research Society, 6-7 Apr. 1995, Warsaw, Poland

Report No.(s): INIS-mf-14706; CONF-9504236; DE96- 615768; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The 10th national conference of M. Skłodowska-Curie Polish Radiation Research Society has given the opportunity to present novel Polish achievements in all fields of radiation research, e.g. radiation chemistry and biology, radiation processing, environmental study, mathematical modeling and simulation, as well as different theoretical studies. As a whole, it may be treated as a review of actual state of art. The scientific progress made since 1992, when the 9th national conference took place, can be assessed on the base of presented material.

DOE

*Radiation Effects; Conferences; Radiation Chemistry; Radiobiology; Mathematical Models; Biological Effects*

**19960044684** Atomic Energy Control Board, Ottawa, Ontario Canada

**RBE from a microdosimetric approach**

Prestwich, W. V., McMaster Univ., Canada; Nunes, J., McMaster Univ., Canada; Kwok, C. S., McMaster Univ., Canada; Sep. 1995; 86p; In English

Contract(s)/Grant(s): AECB Proj. 3.134.1

Report No.(s): INFO-0593; DE96-620456; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report reviews the current status of microdosimetry and knowledge regarding the response of biological systems to radiation fields of differing linear energy transfer (LET). The primary objective is to investigate the potential application to radon daughter lung dosimetry. The concept of track structure and its statistical behavior is discussed and applied to estimate the yield of double strand breaks (DSBs). The general microdosimetric approach to modelling radiation response is presented in terms of the hit-size effectiveness function and the behaviour for specific proposed functions is examined. Radiobiological investigations of the DSB,

chromosome aberration and oncogenic transformation end points are reviewed with emphasis on recent developments. A simplified model system is developed illustrating the potential for analysis of the risk from radon daughter inhalation and published research directed towards this goal is discussed. DOE

*Linear Energy Transfer (LET); Relative Biological Effectiveness (RBE); Radon; Radiation Effects; Lungs; Radiobiology; Mathematical Models*

**19960046034**

**Direct current heating in superconductor-insulator-superconductor tunnel devices for THz mixing applications** Dieleman, P., Univ of Groningen, Netherlands; Klapwijk, T. M.; Kovtonyuk, S.; Van De Stadt, H.; Applied Physics Letters; July 15 1996; ISSN 0003-6951; vol. 69, no. 3. pp.418-420; In English; Copyright; Avail: Issuing Activity

With the aim of studying the direct current heating effects in superconductor-insulator-superconductor tunnel devices, the photon-assisted tunneling and heterodyne mixing up to terahertz frequencies are studied using both all-niobium tunnel junctions and niobium tunnel junctions with aluminum wiring layers. The heat flow is analyzed theoretically and compared with experimental results.

Author (EI)

*Aluminum; Direct Current; Electron Tunneling; Heating; Heterodyning; Mathematical Models; Niobium; Superconductors (Materials); Tunnel Junctions*

### 53

## BEHAVIORAL SCIENCES

*Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.*

**19960044386** Fujitsu Ltd., Electronic Systems Labs., Tokyo, Japan

**A 3D-Display Technology and Stereoscopic Effect of View** Nakashima, Masato, Fujitsu Ltd., Japan; Proceedings of the 13th NAL Symposium on Aircraft Computational Aerodynamics; Jan. 1996, pp. 7-12; In Japanese; Also announced as 19960044384; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper describes recent developments of a three dimensional (3D) display. 3D display is required to satisfy the four functions of eye faculty. The stereoscopic function is effective in the order of binocular disparity, motion parallax, vergence and accommodation. to realize natural stereoscopic vision, motion parallax is important for the 3D vision as shown by computer generated (CG) graphics. Binocular stereo vision cannot provide motion parallax nor wide visual range. This method, therefore, is not enough for stereoscopic expression compared with CG. A multiple eye stereogram, which is now developed, can provide the larger three func-

tions including motion parallax, so it can give a better realistic sensation of natural stereoscopic expression.

Author

*Binocular Vision; Computer Graphics; Eye (Anatomy); Parallax; Stereoscopic Vision; Visual Accommodation; Visual Perception; Motion Perception; Visual Tasks*

**19960045629** Wisconsin Univ., Dept. of Psychology, Madison, WI USA

**Processes Involved in the Integration of Pictures and Discourse** *Final Report, 1 Jun. 1992 - 1 Oct. 1995*

Glenberg, Arthur M., Wisconsin Univ., USA; Jan. 31, 1996; 103p; In English

Contract(s)/Grant(s): F49620-92-J-0310; AF Proj. 3484

Report No.(s): AD-A304255; AFOSR-TR-96-0049; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

There is no doubt that pictures can enhance text comprehension, and sometimes the effect is extraordinary. But how do pictures have this effect? One hypothesis is that pictures help to structure a spatial mental model. Indeed, initial results were strongly compatible with this hypothesis and contrary to others. Subsequent research was directed at characterizing the mental model. One possibility is that the mental model has a Euclidean structure and that it is formed using the spatial component of working memory. Although a type of working memory is clearly involved in mental model formation, three types of research have demonstrated that the mental model is unlikely to be Euclidean. First, the degree of priming between elements of the mental model is unrelated to Euclidean distance; instead, functional distance seems to matter. Second, there is little benefit produced by readers producing drawings when they read unillustrated texts (see Robertson & Glenberg). Third, a careful analysis of memory and its functioning reveals that accounts based on the concept of embodiment provide a more satisfactory explanation than accounts based on considering mental models to be constructed in an unstructured Euclidean space.

DTIC

*Mental Performance; Pixels; Memory*

**19960045636** Boston Univ., Boston, MA USA

**Neural models of motion perception** *Final Report, 1 Sept. 1992 - 31 Aug. 1995*

Grossberg, Stephen, Principal Investigator, Boston Univ., USA; Mingolla, Ennio, Principal Investigator, Boston Univ., USA; Feb. 1996; 18p; In English

Contract(s)/Grant(s): F49620-92-J-0334

Report No.(s): AD-A305452; AFOSR-TR-96-0089; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Six research projects supported by this grant during the final year have resulted in one published book chapter two refereed articles in press, three articles under review, and one refereed conference publication. Areas of research included

design and simulation of network architectures for: (1) motion perception; (2) brightness perception; (3) spatial pooling and perceptual framing by synchronized cortical dynamics; (4) binocular disparity processing; (5) synthetic aperture radar processing by a multiple scale neural system for boundary and surface representation; and (6) perception of lightness in 3-D curved objects. In all, the grant supported 9 refereed publications, 9 refereed conference articles, 3 book chapters, and 4 articles currently under review.

DTIC

*Synthetic Aperture Radar; Brightness; Motion Perception; Binocular Vision*

## 54

### MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

*Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.*

**19960044617** Atomic Energy Control Board, Ottawa, Ontario Canada

#### **Human factors guides**

Penington, J., PHF Services, Inc., Canada; Oct. 1995; 273p; In English

Contract(s)/Grant(s): AECB Proj. 2.280.2

Report No.(s): INFO-0605; DE96-621303; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche; US Sales Only; US Sales Only

This document presents human factors guides, which have been developed in order to provide licensees of the Atomic Energy Control Board (AECB) with advice as to how to address human factors issues within the design and assessment process. This documents presents the results of a three part study undertaken to develop three guides which are enclosed in this document as Parts B, C and D. As part of the study human factors standards, guidelines, handbooks and other texts were researched, to define those which would be most useful to the users of the guides and for the production of the guides themselves. Detailed specifications were then produced to outline the proposed contents and format of the three guides.

Author (DOE)

*Handbooks; Human Factors Engineering; Nuclear Reactor Control; Industrial Safety; Safety Factors; Operator Performance; Education; Textbooks*

**19960045365** Advisory Group for Aerospace Research and Development, Aerospace Medical Panel, Neuilly-Sur-Seine, France

**Anthropomorphic Dummies for Crash and Escape System Testing** *Mannequins Anthropométriques Utilises Lors des Tests d'Impact et d'Ejection*

Jul. 1996; 120p; In English

Report No.(s): AGARD-AR-330; ISBN-92-836-1039-3; Copyright Waived; Avail: CASI; A06, Hardcopy; A02, Microfiche

Anthropomorphic dummies for crash and escape system testing have been used by military and civilian agencies for many years to assess, develop and standardize safer occupant restraint systems for land and air vehicles. The automotive industry has spent considerable effort in designing crash test dummies that are biofidelic; i.e., dummies that duplicate the properties of a representative human subject on which injury risk is to be assessed. This advisory report addresses the status and direction of the technology of aircraft ejection and automotive crash test dummies from the point of view of the following: historical review of important dummies developed in NATO; human biomechanical response requirements of current adult dummies; anthropometry of current adult dummies; injury tolerance criteria for impact exposure of these dummies; dummy instrumentation and data acquisition systems; new developments in dummies; mathematical models as human surrogates; and dummy users in NATO. Recommendations include the need for the following: relating aircraft system effectiveness testing to dummy injury criteria; full line of dummy sizes to accommodate entire flying population; enhanced dummy instrumentation and data acquisition systems; affordability of dummy acquisition, use and maintenance; and validation and increased use of mathematical models as human surrogates.

Author

*Dummies; Escape Systems; Crashes; Anthropometry; Safety Devices; Ejection Seats; Bionics; Test Equipment*

**19960045534** Department of the Navy, Washington, DC USA

#### **Large Scale Purification of Contaminated Air**

Uhm, Han S., Inventor, Department of the Navy, USA; Dec. 26, 1995; 13p; In English

Patent Info.: US-Patent-Appl-SN-438593; US-Patent- 5,478,532

Report No.(s): AD-D017954; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A weakly ionized plasma is generated by continuous high-power microwave within a dielectric cavity positioned in a slow waveguide. Contaminated air under atmospheric pressure is exposed to the plasma within the waveguide cavity for a limited saturation time controlled by inflow at a regulated flow rate. During such limited saturation time, the contaminated air is purified by sequential ionization and recombination under an electron temperature resulting in a microwave discharge plasma dominated by atomic oxygen at a relatively high saturation density level together with atomic nitrogen at a relatively low density level.

DTIC



*Air Purification; Contamination; Plasmas (Physics); Ionization; Oxygen Atoms; Nitrogen Atoms; Microwave Equipment; Air Pollution*

**19960045556** Department of the Navy, Washington, DC USA

**Large Scale Purification of Contaminated Air**

Uhm, Han S., Inventor, Department of the Navy, USA; Nov. 21, 1995; 13p; In English; Supersedes AD-D015064  
Patent Info.: US-Patent-Appl-SN-749244; US-Patent-5,468,356  
Report No.(s): AD-D017949; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A weakly ionized plasma is generated by continuous high-power microwave within a dielectric cavity positioned in a slow waveguide. Contaminated air under atmospheric pressure is exposed to the plasma within the waveguide cavity for a limited saturation time controlled by inflow at a regulated flow rate. During such limited saturation time the contaminated air is purified by sequential ionization and recombination under an electron temperature resulting in a microwave discharge plasma dominated by atomic oxygen at a relatively high saturation density level together with atomic nitrogen at a relatively low density level.

DTIC

*Plasmas (Physics); Air Purification; Contamination; Ionization; Air Pollution; Nitrogen Atoms; Oxygen Atoms; Microwave Equipment*

# Subject Term Index

## A

ABERRATION, 7  
ABSORPTION SPECTROSCOPY, 6  
AEROEMBOLISM, 6  
AEROSPACE ENVIRONMENTS, 1  
AIR POLLUTION, 11  
AIR PURIFICATION, 11  
ALGORITHMS, 4, 7  
ALTITUDE ACCLIMATIZATION, 6  
ALTITUDE SICKNESS, 6  
ALUMINUM, 9  
ANTHROPOMETRY, 10  
AQUICULTURE, 2  
ARMED FORCES (UNITED STATES),  
6  
ARTERIES, 5  
ATROPHY, 2

## B

BALLOONS, 6  
BINOCULAR VISION, 9, 10  
BIOCHEMISTRY, 8  
BIODYNAMICS, 3  
BIOGRAPHY, 7  
BIOLOGICAL DIVERSITY, 6  
BIOLOGICAL EFFECTS, 1, 5, 7, 8  
BIONICS, 10  
BLOOD COAGULATION, 3  
BODY FLUIDS, 6  
BONE DEMINERALIZATION, 8  
BONE MARROW, 7  
BONES, 8  
BRAIN DAMAGE, 6  
BRIGHTNESS, 10

## C

CANADA, 8  
CANCER, 7  
CANOPIES (VEGETATION), 1  
CARBON DIOXIDE, 2  
CARDIOVASCULAR SYSTEM, 3  
CATHETERIZATION, 3  
CHROMOSOMES, 1, 7  
CLINICAL MEDICINE, 5  
CLOSED ECOLOGICAL SYSTEMS, 2  
COMPOSITION (PROPERTY), 3  
COMPTON EFFECT, 4

COMPUTER GRAPHICS, 9  
COMPUTER PROGRAMS, 1  
COMPUTER TECHNIQUES, 7  
COMPUTERIZED SIMULATION, 4  
CONDUCTING POLYMERS, 3  
CONDUCTORS, 3  
CONFERENCES, 6, 8  
CONTAMINATION, 11  
CONTINUOUS WAVE LASERS, 5  
CORIOLIS EFFECT, 5  
CRASHES, 10  
CYTOMETRY, 7

## D

DATA PROCESSING, 1  
DEFORMATION, 3  
DIRECT CURRENT, 9  
DOSAGE, 7  
DRINKING, 6  
DUMMIES, 10

## E

EDUCATION, 10  
EJECTION SEATS, 10  
ELASTIC PROPERTIES, 3  
ELECTROCHEMISTRY, 3  
ELECTRODES, 3  
ELECTROLYTES, 3  
ELECTROMAGNETIC WAVE TRANS-  
MISSION, 4  
ELECTRON SCATTERING, 4  
ELECTRON TUNNELING, 9  
ENZYMES, 2  
ERYTHROCYTES, 3  
ESCAPE SYSTEMS, 10  
EYE (ANATOMY), 9

## F

FETUSES, 6  
FIBRIN, 3  
FLUID FLOW, 3  
FORESTS, 1

## G

GAS EXCHANGE, 2

GASTROINTESTINAL SYSTEM, 6  
GRAVITATIONAL EFFECTS, 1

## H

HAIR, 6  
HANDBOOKS, 10  
HEATING, 9  
HEMOSTATICS, 3  
HEPARINS, 3  
HERBICIDES, 5  
HETERODYNING, 9  
HUMAN FACTORS ENGINEERING, 10  
HYPOXEMIA, 6  
HYPOXIA, 6

## I

IMAGE PROCESSING, 1  
IMAGE RECONSTRUCTION, 4  
IMAGING TECHNIQUES, 4, 7  
INDUSTRIAL SAFETY, 10  
INTERFACES, 3  
ION EXCHANGING, 3  
IONIZATION, 11  
IONIZING RADIATION, 1  
IRRADIATION, 1

## L

LAGRANGIAN FUNCTION, 3  
LESIONS, 6  
LIFE SCIENCES, 1  
LIGHT SCATTERING, 4  
LINEAR ENERGY TRANSFER (LET),  
9  
LIPIDS, 2  
LUNGS, 9  
LYMPHOCYTES, 7

## M

MAGNETIC RESONANCE, 4  
MARINE BIOLOGY, 2  
MASS FLOW, 2  
MATHEMATICAL MODELS, 5, 8, 9  
MEDICAL EQUIPMENT, 3, 4  
MEDICAL SCIENCE, 5, 7  
MEMBRANES, 3

MEMORY, 9  
MENTAL PERFORMANCE, 9  
METABOLISM, 2  
MICROGRAVITY, 1  
MICROWAVE EQUIPMENT, 11  
MITOSIS, 7  
MONKEYS, 2  
MONTE CARLO METHOD, 4  
MOTION PERCEPTION, 9, 10  
MOTION SICKNESS, 5  
MUSCLES, 2

## **N**

NEUTRON ACTIVATION ANALYSIS, 6  
NEUTRON BEAMS, 7  
NIOBIUM, 9  
NITROGEN ATOMS, 11  
NUCLEAR ELECTRIC POWER GENERATION, 8  
NUCLEAR MEDICINE, 7  
NUCLEAR REACTOR CONTROL, 10

## **O**

OPERATOR PERFORMANCE, 10  
ORGANIC COMPOUNDS, 3  
OXYGEN ATOMS, 11  
OXYGEN CONSUMPTION, 2, 6

## **P**

PARALLAX, 9  
PARAMETER IDENTIFICATION, 4  
PECLET NUMBER, 3  
PHOTOMETERS, 4  
PHYSIOLOGICAL RESPONSES, 8  
PIXELS, 9  
PLANTS (BOTANY), 1  
PLASMA CONTROL, 4  
PLASMAS (PHYSICS), 11  
POLYMERIZATION, 2  
POSITRONS, 4  
PROTEINS, 2, 5  
PUBLIC HEALTH, 5, 6

## **R**

RADIATION CHEMISTRY, 8  
RADIATION DISTRIBUTION, 7  
RADIATION DOSAGE, 1, 7  
RADIATION EFFECTS, 1, 8, 9  
RADIATION PROTECTION, 8

RADIOBIOLOGY, 8, 9  
RADON, 9  
RANDOM SIGNALS, 4  
RATS, 6  
RELATIVE BIOLOGICAL EFFECTIVENESS (RBE), 7, 9  
RESEARCH, 8  
RESPONSES, 2

## **S**

SAFETY DEVICES, 10  
SAFETY FACTORS, 10  
SHIPS, 5  
SPACEBORNE EXPERIMENTS, 2  
STEREOSCOPIC VISION, 9  
STRAIN DISTRIBUTION, 3  
SUPERCONDUCTORS (MATERIALS), 9  
SYNTHETIC APERTURE RADAR, 10

## **T**

TEST EQUIPMENT, 10  
TEXTBOOKS, 10  
THERAPY, 7  
TIMBER VIGOR, 1  
TIME FUNCTIONS, 1  
TISSUES (BIOLOGY), 2, 3, 5  
TOMOGRAPHY, 4  
TOXICITY, 6  
TRACE ELEMENTS, 6  
TRANSIENT RESPONSE, 8  
TRANSPLANTATION, 7  
TUNNEL JUNCTIONS, 9

## **V**

VASOCONSTRICTION, 6  
VEINS, 6  
VERTICAL MOTION, 5  
VISUAL ACCOMMODATION, 9  
VISUAL PERCEPTION, 9  
VISUAL TASKS, 9

## **W**

WATER, 6  
WAVE ATTENUATION, 4  
WEIGHTLESSNESS, 2  
WOUND HEALING, 3

# Personal Author Index

## A

Amaral, Angela Maria, 6  
Amiro, B. D., 1

## B

Baker, Daniel R., 3  
Bauer, Clarence F., 2  
Bodine-Fowler, Sue, 2  
Bos, J. E., 5

## C

Celliers, Peter M., 4  
Christensen, Nelson L., 3  
Coates, Geoffrey, 6  
Comanor, K. A., 4

## D

DaSilva, Luiz B., 4  
De Rossi, D., 3  
deCastro de Assis, Adilson, 6  
deVilhena Schayer Sabino, Claudia, 6  
Dieleman, P., 9  
Duncan, Randall L., 8

## E

Eberlein, Robert, 3  
Eder, David C., 4

## F

Fernandes, Marcio Prado, 6  
Francisco, Dovenir, 6  
Franco, Milton Batista, 6

## G

Glenberg, Arthur M., 9  
Glinsky, Michael E., 4  
Grossberg, Stephen, 9  
Grubbe, William D., 5  
Guedes, Joao Bosco, 6

## H

Halstead, Thora W., 1  
Hammer, Bruce E., 3  
Heredia, Nicholas J., 4  
Holm, Soren, 4  
Holzapfel, Gerhard A., 3  
Houston, Charles S., 6

## J

Jensen, Mikael, 4

## K

Klapwijk, T. M., 9  
Kovtonyuk, S., 9  
Kwok, C. S., 8

## L

London, Richard A., 4  
Lustik, Michael B., 5

## M

Maitland, Duncan J., 4  
Matthews, Dennis L., 4  
Mazzoldi, A., 3  
McLean, J.R.N., 7  
Medina Martin, D., 1  
Michalek, Joe E., 5  
Mingolla, Ennio, 9  
Moses, W. W., 4  
Muller, Matthew S., 2

## N

Nakashima, Masato, 9  
Nunes, J., 8

## O

Ohman, Lynne E., 6

## P

Penington, J., 10  
Peraza Gonzalez, L. H., 1  
Prestwich, W. V., 8

## R

Raylman, Raymond R., 3

## S

Santa, A. Della, 3  
Sato, Takashi, 6  
Silva, Ascanio Barros F. E., 6  
Singh, Alok, 2  
Small, Ward, IV, 4  
Soltz, Barbara A., 4  
Sutton, John R., 6

## T

Toft, Peter, 4

## U

Uhm, Han S., 10, 11  
Utsumi, Hiroshi, 6  
Utsuro, Masahiko, 6

## V

Van De Stadt, H., 9  
Verbrugge, Mark W., 3  
Virador, P. R. G., 4

## W

Weizsacker, Hans W., 3  
Williams, David, 5  
Williams, David E., 5  
Wolfe, William H., 5  
Wriggers, Peter, 3

# Availability of Cited Publications

## Open Literature Entries (A96-60000 Series)

Inquiries and requests should be addressed to:

NASA Center for AeroSpace Information  
800 Elkridge Landing Road  
Linthicum Heights, MD 21090-2934.

Orders are also taken by telephone, (301) 621-0390, e-mail, [help@sti.nasa.gov](mailto:help@sti.nasa.gov), and fax, (301) 621-0134. Please refer to the accession number when requesting publications.

## STAR Entries (N96-10000 Series)

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below, and their addresses are listed on page APP-3. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: NASA CASI. Sold by the NASA Center for AeroSpace Information. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page APP-4.

*Note on Ordering Documents: When ordering publications from NASA CASI, use the N accession number or other report number. It is also advisable to cite the title and other bibliographic identification.*

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in Energy Research Abstracts. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center—Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on ESDU International topic categories can be obtained from ESDU International.

Avail: Fachinformationszentrum Karlsruhe. Gesellschaft für wissenschaftlich-technische Information mbH 76344 Eggenstein-Leopoldshafen, Germany.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration (JBD-4), Public Documents Room (Room

1H23), Washington, DC 20546-0001, or public document rooms located at NASA installations, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

- Avail: NTIS. Sold by the National Technical Information Service. Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) are available. For information concerning this service, consult the NTIS Subscription Section, Springfield, VA 22161.
- Avail: Univ. Microfilms. Documents so indicated are dissertations selected from Dissertation Abstracts and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.
- Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of \$1.50 each, postage free.
- Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.
- Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed on page APP-3. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

## Federal Depository Library Program

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 53 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 53 regional depositories. A list of the regional GPO libraries, arranged alphabetically by state, appears on the inside back cover of this issue. These libraries are not sales outlets. A local library can contact a regional depository to help locate specific reports, or direct contact may be made by an individual.

## Public Collection of NASA Documents

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols # and \* from FIZ—Fachinformation Karlsruhe—Bibliographic Service, D-76344 Eggenstein-Leopoldshafen, Germany and TIB—Technische Informationsbibliothek, P.O. Box 60 80, D-30080 Hannover, Germany.

# Addresses of Organizations

British Library Lending Division  
Boston Spa, Wetherby, Yorkshire  
England

Commissioner of Patents and Trademarks  
U.S. Patent and Trademark Office  
Washington, DC 20231

Department of Energy  
Technical Information Center  
P.O. Box 62  
Oak Ridge, TN 37830

European Space Agency—  
Information Retrieval Service ESRIN  
Via Galileo Galilei  
00044 Frascati (Rome) Italy

ESDU International  
27 Corsham Street  
London  
N1 6UA  
England

Fachinformationszentrum Karlsruhe  
Gesellschaft für wissenschaftlich–technische  
Information mbH  
76344 Eggenstein–Leopoldshafen, Germany

Her Majesty's Stationery Office  
P.O. Box 569, S.E. 1  
London, England

NASA Center for AeroSpace Information  
800 Elkridge Landing Road  
Linthicum Heights, MD 21090–2934

National Aeronautics and Space Administration  
Scientific and Technical Information Office  
(Code JT)  
Washington, DC 20546–0001

National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161

Pendragon House, Inc.  
899 Broadway Avenue  
Redwood City, CA 94063

Superintendent of Documents  
U.S. Government Printing Office  
Washington, DC 20402

University Microfilms  
A Xerox Company  
300 North Zeeb Road  
Ann Arbor, MI 48106

University Microfilms, Ltd.  
Tylers Green  
London, England

U.S. Geological Survey Library National Center  
MS 950  
12201 Sunrise Valley Drive  
Reston, VA 22092

U.S. Geological Survey Library  
2255 North Gemini Drive  
Flagstaff, AZ 86001

U.S. Geological Survey  
345 Middlefield Road  
Menlo Park, CA 94025

U.S. Geological Survey Library  
Box 25046  
Denver Federal Center, MS914  
Denver, CO 80225

# ***The New NASA Video Catalog is Here***

**Free!**

To order your copy,  
call the NASA Access Help Desk at  
(301) 621-0390,  
fax to  
(301) 621-0134,  
e-mail to  
help@sti.nasa.gov,  
or visit the NASA STI program  
homepage at

<http://www.sti.nasa.gov/STI-homepage.html>

*(Select STI Program Bibliographic Announcements)*

## ***Explore the Universe!***



# NASA CASI Price Code Table

(Effective July 1, 1996)

CASI PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	\$ 6.50	\$ 13.00
A02	10.00	20.00
A03	19.50	39.00
A04-A05	21.50	43.00
A06	25.00	50.00
A07	28.00	56.00
A08	31.00	62.00
A09	35.00	70.00
A10	38.00	76.00
A11	41.00	82.00
A12	44.00	88.00
A13	47.00	94.00
A14-A17	49.00	98.00
A18-A21	57.00	114.00
A22-A25	67.00	134.00
A99	Call For Price	Call For Price

## Important Notice

The \$1.50 domestic and \$9.00 foreign shipping and handling fee currently being charged will remain the same. Foreign airmail is \$27.00 for the first 1-3 items, \$9.00 for each additional item. Additionally, a new processing fee of \$2.00 per each video ordered will be assessed.

For users registered at the NASA CASI, document orders may be invoiced at the end of the month, charged against a deposit account, or paid by check or credit card. NASA CASI accepts American Express, Diners' Club, MasterCard, and VISA credit cards. There are no shipping and handling charges. To register at the NASA CASI, please request a registration form through the NASA Access Help Desk at the numbers or addresses below.

## Return Policy

The NASA Center for AeroSpace Information will gladly replace or make full refund on items you have requested if we have made an error in your order, if the item is defective, or if it was received in damaged condition and you contact us within 30 days of your original request. Just contact our NASA Access Help Desk at the numbers or addresses listed below.

NASA Center for AeroSpace Information  
800 Elkridge Landing Road  
Linthicum Heights, MD 21090-2934

E-mail: [help@sti.nasa.gov](mailto:help@sti.nasa.gov)  
Fax: (301) 621-0134  
Phone: (301) 621-0390

Rev. 6/96

# Report Documentation Page

1. Report No. NASA SP-7011 (425)	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Aerospace Medicine and Biology A Continuing Bibliography (Supplement 425)		5. Report Date October 28, 1996	
		6. Performing Organization Code JT	
7. Author(s)		8. Performing Organization Report No.	
		10. Work Unit No.	
9. Performing Organization Name and Address NASA Scientific and Technical Information Program Office		11. Contract or Grant No.	
		13. Type of Report and Period Covered Special Publication	
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, DC 20546-0001		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract This report lists 35 reports, articles and other documents recently announced in the NASA STI Database.			
17. Key Words (Suggested by Author(s)) Aerospace Medicine Bibliographies Biological Effects		18. Distribution Statement Unclassified – Unlimited Subject Category – 52	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 26	22. Price A03/HC

# Federal Regional Depository Libraries

## ALABAMA

### AUBURN UNIV. AT MONTGOMERY LIBRARY

Documents Dept.  
7300 University Dr.  
Montgomery, AL 36117-3596  
(205) 244-3650 Fax: (205) 244-0678

### UNIV. OF ALABAMA

Amelia Gayle Gorgas Library  
Govt. Documents  
P.O. Box 870266  
Tuscaloosa, AL 35487-0266  
(205) 348-6046 Fax: (205) 348-0760

## ARIZONA

### DEPT. OF LIBRARY, ARCHIVES, AND PUBLIC RECORDS

Research Division  
Third Floor, State Capitol  
1700 West Washington  
Phoenix, AZ 85007  
(602) 542-3701 Fax: (602) 542-4400

## ARKANSAS

### ARKANSAS STATE LIBRARY

State Library Service Section  
Documents Service Section  
One Capitol Mall  
Little Rock, AR 72201-1014  
(501) 682-2053 Fax: (501) 682-1529

## CALIFORNIA

### CALIFORNIA STATE LIBRARY

Govt. Publications Section  
P.O. Box 942837 - 914 Capitol Mall  
Sacramento, CA 94337-0091  
(916) 654-0069 Fax: (916) 654-0241

## COLORADO

### UNIV. OF COLORADO - BOULDER

Libraries - Govt. Publications  
Campus Box 184  
Boulder, CO 80309-0184  
(303) 492-8834 Fax: (303) 492-1881

### DENVER PUBLIC LIBRARY

Govt. Publications Dept. BSG  
1357 Broadway  
Denver, CO 80203-2165  
(303) 640-8846 Fax: (303) 640-8817

## CONNECTICUT

### CONNECTICUT STATE LIBRARY

231 Capitol Avenue  
Hartford, CT 06106  
(203) 566-4971 Fax: (203) 566-3322

## FLORIDA

### UNIV. OF FLORIDA LIBRARIES

Documents Dept.  
240 Library West  
Gainesville, FL 32611-2048  
(904) 392-0366 Fax: (904) 392-7251

## GEORGIA

### UNIV. OF GEORGIA LIBRARIES

Govt. Documents Dept.  
Jackson Street  
Athens, GA 30602-1645  
(706) 542-8949 Fax: (706) 542-4144

## HAWAII

### UNIV. OF HAWAII

Hamilton Library  
Govt. Documents Collection  
2550 The Mall  
Honolulu, HI 96822  
(808) 948-8230 Fax: (808) 956-5968

## IDAHO

### UNIV. OF IDAHO LIBRARY

Documents Section  
Rayburn Street  
Moscow, ID 83844-2353  
(208) 885-6344 Fax: (208) 885-6817

## ILLINOIS

### ILLINOIS STATE LIBRARY

Federal Documents Dept.  
300 South Second Street  
Springfield, IL 62701-1796  
(217) 782-7596 Fax: (217) 782-6437

## INDIANA

### INDIANA STATE LIBRARY

Serials/Documents Section  
140 North Senate Avenue  
Indianapolis, IN 46204-2296  
(317) 232-3679 Fax: (317) 232-3728

## IOWA

### UNIV. OF IOWA LIBRARIES

Govt. Publications  
Washington & Madison Streets  
Iowa City, IA 52242-1166  
(319) 335-5926 Fax: (319) 335-5900

## KANSAS

### UNIV. OF KANSAS

Govt. Documents & Maps Library  
6001 Malott Hall  
Lawrence, KS 66045-2800  
(913) 864-4660 Fax: (913) 864-3855

## KENTUCKY

### UNIV. OF KENTUCKY

King Library South  
Govt. Publications/Maps Dept.  
Patterson Drive  
Lexington, KY 40506-0039  
(606) 257-3139 Fax: (606) 257-3139

## LOUISIANA

### LOUISIANA STATE UNIV.

Middleton Library  
Govt. Documents Dept.  
Baton Rouge, LA 70803-3312  
(504) 388-2570 Fax: (504) 388-6992

### LOUISIANA TECHNICAL UNIV.

Prescott Memorial Library  
Govt. Documents Dept.  
Ruston, LA 71272-0046  
(318) 257-4962 Fax: (318) 257-2447

## MAINE

### UNIV. OF MAINE

Raymond H. Fogler Library  
Govt. Documents Dept.  
Orono, ME 04469-5729  
(207) 581-1673 Fax: (207) 581-1653

## MARYLAND

### UNIV. OF MARYLAND - COLLEGE PARK

McKeldin Library  
Govt. Documents/Maps Unit  
College Park, MD 20742  
(301) 405-9165 Fax: (301) 314-9416

## MASSACHUSETTS

### BOSTON PUBLIC LIBRARY

Govt. Documents  
666 Boylston Street  
Boston, MA 02117-0286  
(617) 536-5400, ext. 226  
Fax: (617) 536-7758

## MICHIGAN

### DETROIT PUBLIC LIBRARY

5201 Woodward Avenue  
Detroit, MI 48202-4093  
(313) 833-1025 Fax: (313) 833-0156

### LIBRARY OF MICHIGAN

Govt. Documents Unit  
P.O. Box 30007  
717 West Allegan Street  
Lansing, MI 48909  
(517) 373-1300 Fax: (517) 373-3381

## MINNESOTA

### UNIV. OF MINNESOTA

Govt. Publications  
409 Wilson Library  
309 19th Avenue South  
Minneapolis, MN 55455  
(612) 624-5073 Fax: (612) 626-9353

## MISSISSIPPI

### UNIV. OF MISSISSIPPI

J.D. Williams Library  
106 Old Gym Bldg.  
University, MS 38677  
(601) 232-5857 Fax: (601) 232-7465

## MISSOURI

### UNIV. OF MISSOURI - COLUMBIA

106B Ellis Library  
Govt. Documents Sect.  
Columbia, MO 65201-5149  
(314) 882-6733 Fax: (314) 882-8044

## MONTANA

### UNIV. OF MONTANA

Mansfield Library  
Documents Division  
Missoula, MT 59812-1195  
(406) 243-6700 Fax: (406) 243-2060

## NEBRASKA

### UNIV. OF NEBRASKA - LINCOLN

D.L. Love Memorial Library  
Lincoln, NE 68588-0410  
(402) 472-2562 Fax: (402) 472-5131

## NEVADA

### THE UNIV. OF NEVADA LIBRARIES

Business and Govt. Information Center  
Reno, NV 89557-0044  
(702) 784-6579 Fax: (702) 784-1751

## NEW JERSEY

### NEWARK PUBLIC LIBRARY

Science Div. - Public Access  
P.O. Box 630  
Five Washington Street  
Newark, NJ 07101-7812  
(201) 733-7782 Fax: (201) 733-5648

## NEW MEXICO

### UNIV. OF NEW MEXICO

General Library  
Govt. Information Dept.  
Albuquerque, NM 87131-1466  
(505) 277-5441 Fax: (505) 277-6019

### NEW MEXICO STATE LIBRARY

325 Don Gaspar Avenue  
Santa Fe, NM 87503  
(505) 827-3824 Fax: (505) 827-3888

## NEW YORK

### NEW YORK STATE LIBRARY

Cultural Education Center  
Documents/Gift & Exchange Section  
Empire State Plaza  
Albany, NY 12230-0001  
(518) 474-5355 Fax: (518) 474-5786

## NORTH CAROLINA

### UNIV. OF NORTH CAROLINA - CHAPEL HILL

Walter Royal Davis Library  
CB 3912, Reference Dept.  
Chapel Hill, NC 27514-8890  
(919) 962-1151 Fax: (919) 962-4451

## NORTH DAKOTA

### NORTH DAKOTA STATE UNIV. LIB.

Documents  
P.O. Box 5599  
Fargo, ND 58105-5599  
(701) 237-8886 Fax: (701) 237-7138

### UNIV. OF NORTH DAKOTA

Chester Fritz Library  
University Station  
P.O. Box 9000 - Centennial and University Avenue  
Grand Forks, ND 58202-9000  
(701) 777-4632 Fax: (701) 777-3319

## OHIO

### STATE LIBRARY OF OHIO

Documents Dept.  
65 South Front Street  
Columbus, OH 43215-4163  
(614) 644-7051 Fax: (614) 752-9178

## OKLAHOMA

### OKLAHOMA DEPT. OF LIBRARIES

U.S. Govt. Information Division  
200 Northeast 18th Street  
Oklahoma City, OK 73105-3298  
(405) 521-2502, ext. 253  
Fax: (405) 525-7804

### OKLAHOMA STATE UNIV.

Edmon Low Library  
Stillwater, OK 74078-0375  
(405) 744-6546 Fax: (405) 744-5183

## OREGON

### PORTLAND STATE UNIV.

Branford P. Millar Library  
934 Southwest Harrison  
Portland, OR 97207-1151  
(503) 725-4123 Fax: (503) 725-4524

## PENNSYLVANIA

### STATE LIBRARY OF PENN.

Govt. Publications Section  
116 Walnut & Commonwealth Ave.  
Harrisburg, PA 17105-1601  
(717) 787-3752 Fax: (717) 783-2070

## SOUTH CAROLINA

### CLEMSON UNIV.

Robert Muldrow Cooper Library  
Public Documents Unit  
P.O. Box 343001  
Clemson, SC 29634-3001  
(803) 656-5174 Fax: (803) 656-3025

### UNIV. OF SOUTH CAROLINA

Thomas Cooper Library  
Green and Sumter Streets  
Columbia, SC 29208  
(803) 777-4841 Fax: (803) 777-9503

## TENNESSEE

### UNIV. OF MEMPHIS LIBRARIES

Govt. Publications Dept.  
Memphis, TN 38152-0001  
(901) 678-2206 Fax: (901) 678-2511

## TEXAS

### TEXAS STATE LIBRARY

United States Documents  
P.O. Box 12927 - 1201 Brazos  
Austin, TX 78701-0001  
(512) 463-5455 Fax: (512) 463-5436

### TEXAS TECH. UNIV. LIBRARIES

Documents Dept.  
Lubbock, TX 79409-0002  
(806) 742-2282 Fax: (806) 742-1920

## UTAH

### UTAH STATE UNIV.

Merrill Library Documents Dept.  
Logan, UT 84322-3000  
(801) 797-2678 Fax: (801) 797-2677

## VIRGINIA

### UNIV. OF VIRGINIA

Alderman Library  
Govt. Documents  
University Ave. & McCormick Rd.  
Charlottesville, VA 22903-2498  
(804) 824-3133 Fax: (804) 924-4337

## WASHINGTON

### WASHINGTON STATE LIBRARY

Govt. Publications  
P.O. Box 42478  
16th and Water Streets  
Olympia, WA 98504-2478  
(206) 753-4027 Fax: (206) 586-7575

## WEST VIRGINIA

### WEST VIRGINIA UNIV. LIBRARY

Govt. Documents Section  
P.O. Box 6069 - 1549 University Ave.  
Morgantown, WV 26506-6069  
(304) 293-3051 Fax: (304) 293-6638

## WISCONSIN

### ST. HIST. SOC. OF WISCONSIN LIBRARY

Govt. Publication Section  
816 State Street  
Madison, WI 53706  
(608) 264-6525 Fax: (608) 264-6520

### MILWAUKEE PUBLIC LIBRARY

Documents Division  
814 West Wisconsin Avenue  
Milwaukee, WI 53233  
(414) 286-3073 Fax: (414) 286-8074